NOAA Climate Goal

Understand Climate Variability and Change to Enhance Society's Ability to Plan and Respond

OUTCOMES

- A predictive understanding of the global climate system on time scales of weeks to decades with quantified uncertainties sufficient for making informed and reasoned decisions
- Climate-sensitive sectors and the climate-literate public effectively incorporating NOAA's climate products into their plans and decisions

PROGRAMS				
Observations & Analysis	Climate Forcing	Predictions & Projections	Climate & Ecosystems	Regional Decision Support

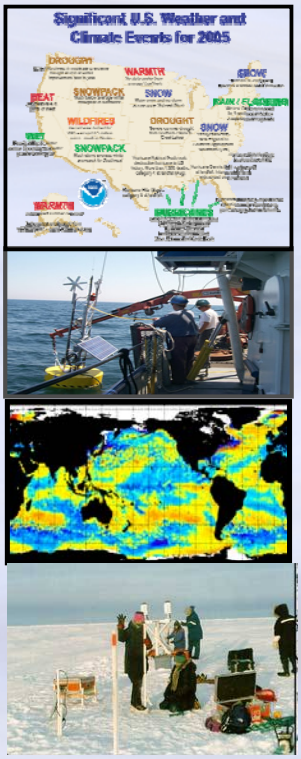
Observations and Analysis

Objective: Describe and understand the state of the climate system through integrated observations, analysis, and data management

Atmosphere:
- Development of Integrated Surface Observing Systems (ISOS)
- Participants: NCDC, NWS, External (national and international)

Oceans:
- Integrated Global Ocean Observing System (51%) complete
- Sea surface temperature, Sea surface height, vector wind, and ocean color
- Participants: PMEL, AOML, External (national and international)

Analysis:
- Developing a program on "Ongoing Analysis" for the global atmosphere, oceans, and land in conjunction with NASA and NSF
- Developing focused regional analyses for select regions, such as North America and the Arctic
- Participants: NWS/NCEP, Climate Diagnostics Center, Arctic Office, Office of Climate Observations, External



Climate Forcing

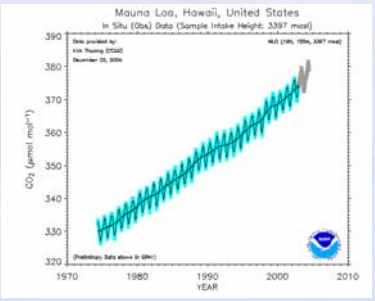
Objective: Reduce uncertainty in climate projection through timely information on the forcing and feedbacks contributing to changes in the Earth's climate

Carbon (and other Greenhouse Gases)

- Atmosphere and Ocean
- Monitoring, Analysis, Model improvements
- Participants: ESRL, PMEL, AOML, GFDL, CPO, External

Atmospheric Composition

- Aerosols and Ozone
- Field programs, Laboratory studies, Model improvements
- Participants: ESRL, CPO, GFDL, External



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Predictions and Projections

Objective: A predictive understanding of the global climate system on timescales of weeks to decades with quantified uncertainties sufficient for making informed decisions on issues related to drought, water resources, ecosystems, fisheries, health, energy, climate and extreme events

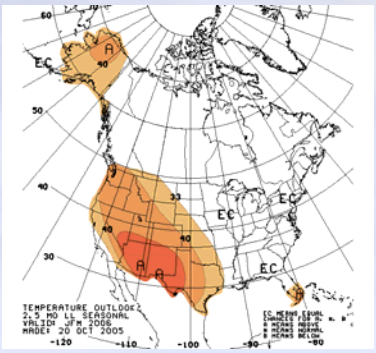
Predictions

- Weekly to Seasonal Operational Forecasts
- New Coupled Climate Forecast System Model at NCEP
- Participants: NWS/NCEP, CDC, External (e.g., IRI)

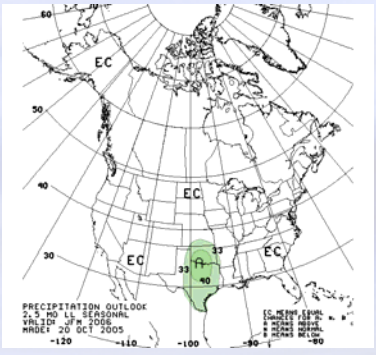
Projections

- Scenarios and Assessments of Climate Change
- New Coupled Climate Model
- Participants: GFDL, External

Temperature Outlook



Precipitation Outlook



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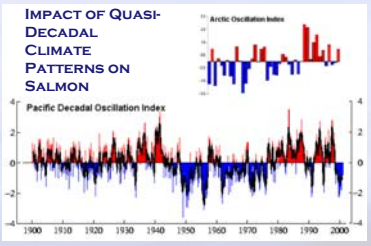
Climate and Ecosystems

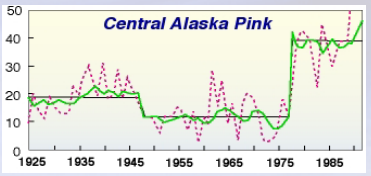
Objective: Understand and predict the consequences of climate variability and change on marine ecosystems

North Pacific Climate Regimes and Ecosystem Productivity Program: Understanding and Forecasting ecosystem response to changing Climate in the North Pacific

Why: Alaska supplies about one half of seafood caught in US

Participants: NOAA Fisheries, NOAA Research





Regional Decision Support

Objective: Increase number and use of climate products and services to enhance public and private sector decision making

Developing a Climate Service

Regional Decision Support

- Regional Integrated Science and Assessments (RISA)
- Regional Climate Centers (External partnership through NCDC)

Sectoral Decision Support

- Health, Agriculture, Energy, Urban, Coastal, Sustainability, Human Dimensions

NOAA Climate Programs vs. NOAA Line Offices

	OAR	NESDIS	NWS	NMFS
Observations and Analysis	Ocean observations, reanalysis, dataset improvements	Climate Reference Network, Data Management		
Climate Forcing	Greenhouse gas observing system, extramural carbon cycle research, aerosol and ozone process research			
Climate Predictions and Projections	Intraseasonal forecasting skill, decadal and long-term projections, extramural research on climate variability		Seasonal climate outlooks	
Climate and Ecosystems				North Pacific Climate and Ecosystems
Regional Decision Support	Decision Support Research, Transition to Applications	Regional Climate Centers	Operational Climate Services	

NOAA Climate

What makes NOAA's role in Climate Science unique?

NOAA has many leadership roles…

- ❑Only agency that provides operational climate forecasts and information services (nationally and internationally)
- ❑ Only agency that provides daily information about climate to all sectors
- ❑Recognized as a leader in climate change science both nationally and internationally
  - ❑ Provides scientific leadership for the Intergovernmental Panel for Climate Change (IPCC) Working Group I
  - ❑ Leader for the US Climate Change Science Program (CCSP)
  - ❑ Leader for 7 of the 21 CCSP Synthesis and Assessment products
- ❑ Leader in the implementation of the Global Ocean Observing System (NOAA contributes 51% of in situ observations, other US agencies 3%)

Examples of interagency coordination: Interagency Working Group on Earth Observations, North American Carbon Program, CCSP Interagency Working Groups

Trends

Bleak Fiscal Climate

Growing Commitments

Increasing External Demands

Expanding Priorities

The Risks of Drift

Opportunities for Climate Research

- Integrated Global Observations
  - Baseline climate observations across the globe in the atmosphere and the oceans to monitor global climate
    - US Climate Reference Network
    - Global Climate Observing System (developing countries)
    - U.S. Integrated Ocean Observing System
- U.S. Climate Change Science Program and International Assessments
  - Continued NOAA leadership in providing state of the science assessments for policy and decision making
- Earth System Modeling
  - Enhanced modeling and supercomputing capabilities for improved management of coastal and marine ecosystems, climate assessments, and seasonal forecasting
- Regional Decision Support
  - Drought impacts research, explaining climate conditions, and climate services supporting development of a National Integrated Drought Information System (NIDIS)

Major Challenges for NOAA Climate Services

1) To ensure that we know how the Earth system has changed/is changing
   - ✓ Climate quality observations and data management

2) To incorporate current knowledge about the earth system into models
   - ✓ Improved predictions on all scales

3) To continue to demonstrate utility of information to decision makers (policy makers, resource managers, public)
   - ✓ An active program to continuously engage users, demonstrate/evaluate services, transition services to operations, and continue to introduce service improvements
   - ✓ Develop a paradigm that effectively applies research to improve operational products and services

4) To improve understanding of processes causing climate variability and change and incorporate it into planned information transfers
   - ✓ A research program for policy and management relevant needs

5) To leverage national and international partnerships
   - ✓ Provide CCSP Synthesis and Assessment Products
   - ✓ Contribute to international assessments (ozone, Annual GHG Index)

Expanding Priorities Evolving AGM Themes

FY 2006 – 2010	FY 2007 – 2011	FY 2008 – 2012
Taking the Pulse of the Planet: Integrate Global Observations	Taking the Pulse of the Planet: Integrate Global Observations	Observation systems, data, and models
[identified within "enablers"]	Advancing NOAA's Modeling Capability	
Expand Climate Services	Increase Climate Information, Services, and Products	Information services, forecasts, and predictions
Improve Water Resource Information	Provide Critical Information for Water Resources	
Facilitate Intermodal Transportation	Support U.S. Transportation Systems	
Advance toward an Ecosystem Orientation	Leadership for the Oceans (ecosystem-based management)	Ocean and coastal ecosystem management
[identified within "approaches"]	Enhance Environmental Literacy	Environmental literacy
Sustain Important National NOAA Programs (forecasts & warnings, weather & air quality, R&D)	Deliver Effective, Efficient Decision-Support Information	Breakthrough organizational performance
Enablers: Environmental modeling; data management; technology; human capital; facilities; platforms; administrative services	*Enablers*: Skills and capabilities of NOAA's workforce; improve administrative programs; maintain and provide necessary platforms; improve critical infrastructure and services; advance use of technology	

Expanding Priorities Evolving AGM Themes

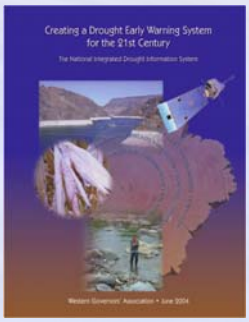
FY 2008 – 2012	FY 2009 – 2013	Priority Activities FY09-FY13
Observation systems, data, and models	*Focus for FY09 on integrated earth observation and information management system for space and non-space based observing systems.*	1. Climate forcing, Air Quality, and Regional Climate Changes 2. CTB projects that influence regions 3. Forecasting decadal signals 4. Integrated Observation System 5. SDS/CLASS 6. Satellite (NOAA-NIST) Cal/Val
Information services, forecasts, and predictions	*Focus for FY09 on Attribution and Understanding of the links between climate and extreme events such as drought, hurricanes, fires, floods, and weather extremes.*	1. Implement NIDIS 2 Enabling hazard resilient communities via development of coastal information 3. Consequences of sectoral changes–understanding and strategies for mitigation and adaptation 4. Climate of the 20th century and past 1,000 years 5. Strengthened provision of climate services regionally, nationally, and internationally

Expanding Priorities Evolving AGM Themes

FY 2008 – 2012	FY 2009 – 2013	Priority Activities FY09-FY13
Ocean and coastal ecosystem management	Understanding of climate impacts on marine ecosystems to improve ecosystem forecasting and management	1. Climate-Ecosystem Competitive Program 2. Climate-Ecosystem Indices 3. Significant change in sea ice extent and duration 4. Vulnerability of fisheries to regime changes
Breakthrough organizational performance	*Focus for FY09 is identification of operational needs from research satellites and new operational capabilities needed by NOAA (i.e. satellite altimeter)*	NASA-NOAA Transition and satellites such as altimeter (To be discussed with Satellites sub-goal)

National Integrated Drought Information System (NIDIS)

"Creating a National Drought Early Warning System".



"WGA believes NOAA should be designated as the federal lead for NIDIS. NOAA should take the initiative to convene and coordinate all of the relevant entities, including federal and non-federal partners, as well as scientists, water users and policy-makers to implement those aspects of NIDIS that can be accomplished under existing authorities and funding."

Implementation will require:

- Building a national drought monitoring and forecasting system
- Creating a drought early warning system
- Providing an interactive drought information delivery system for products and services—including an internet portal and standardized products (databases, forecasts, Geographic Information Systems (GIS), maps, etc)
- Designing mechanisms for improved interaction with public (education materials, forums, etc)

Emerging Delivery of Climate Services

NOAA's climate services provide data, operational, and information products.

Climate Services are the timely production and delivery of useful climate data, information, and knowledge to users, including decision makers.

Product is a general term for tangible results, technology, or information that have potential value in one or more uses.

Current Products; [Future Products]

Type of Service	Sample Products	Frequency of Issuance	Example Users
Data and Monitoring Products	**Observed Data Sets, Climatologies, Climate Normals, Indices, Drought Monitor**	Weekly, Annually, Decadally	Construction, Heating, Fire management,
Assessments	**IPCC, Ozone layer**, **Fisheries stocks** [North American Carbon Budget, Sea level rise impacts]	5 years, Biannually	National/ International energy and land use, Agriculture, Insurance
Outlooks	**Week Two to Interannual, Drought outlook** [Air Quality, chemistry, and ecosystem outlooks, Weather risks.]	Weekly, Monthly	Public health, Energy, Agriculture, Water, resource managers, policy makers, public
Projections ("if…, then…")	**Scenario model runs** [Ecosystem outlooks, Net oceanic and terrestrial primary productivity, Coastal ecosystem response]	Annually, 5 year, 10 year	Energy, Coastal and Marine Ecosystems managers, Policy makers
Regional Decision Support	**Streamflow information, Fine scale climate mapping, Local ENSO impacts** [Wildfire outlooks, Coastal inundation mapping, Regional carbon maps]	On demand, Monthly, Seasonally-Annually	Agriculture, Fire and water resource mgmt., Coastal and fisheries mgmt., Energy/emissions mgmt.

For Discussion: Strategies for FY09

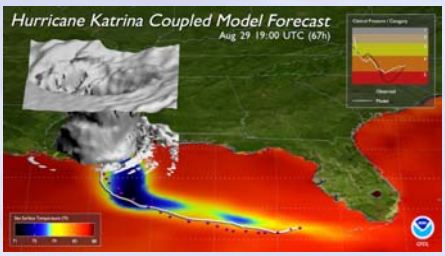
- See-Saw between President's Budget and Enacted Budget – last two fiscal years have seen decreased funding for previous COSP and CCRI budget lines
- NOAA has been working with OMB and Congressional staff to improve its budget structure and enable NOAA to have more flexibility when executing its budget
- Easier to adjust to budget increases than budget decreases
- Planning should assume that decreases in our budget will continue
- How do we prioritize our programs? What are our core capabilities? How are they linked to our requirements?
- Should some activities be eliminated and if so, what is the strategy for selecting them?
- How will programs redirect funds to accommodate new priorities and emerging requirements?

Link to Weather-Related Research

Research Issue: While hurricane tracks are fairly well simulated, hurricane intensity remains problematic.

Solution:

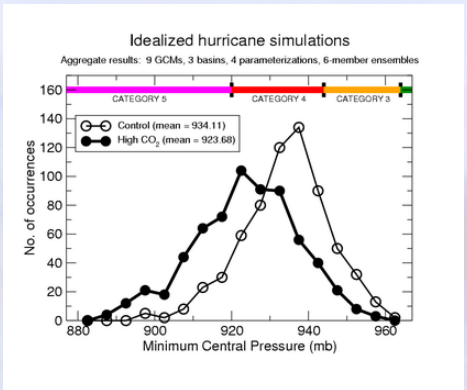
- High resolution models which capture the physical structure of a hurricane.
- Improved monitoring/understanding of the role of oceanic heat on hurricane intensity



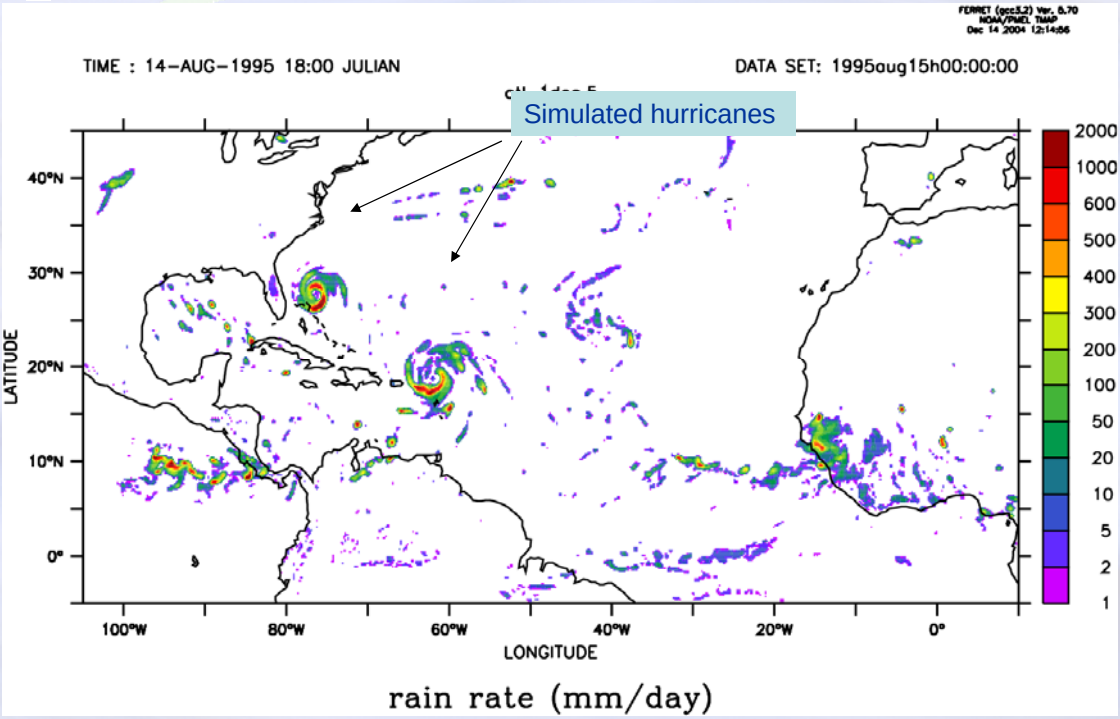
Research Issue: Ascertain the potential impacts of global warming on hurricane intensity/frequency.

Solution:

- Promote research which contributes to the physical understanding of the potential impacts of global warming on hurricanes.
- Continue to upgrade global climate model capability via improved model physics, higher resolution, and better data assimilation.

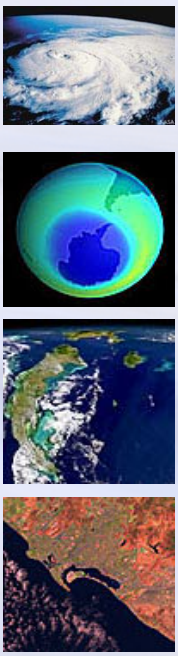


Hurricanes and Climate:
Understanding and Ultimately Predicting Seasonal to Decadal Variations in Hurricane Seasons



GFDL Zetac Nonhydrostatic Regional Model: 18km Tropical N. Atlantic Simulation

Satellite Applications



- Weather analysis, warnings and prediction
- Climate monitoring and prediction
- Environmental hazards monitoring
- Oceanic monitoring and prediction
- Vegetation, agricultural, and hydrological applications
- Atmospheric, oceanic, and climate research